| REPORT DOCUMENTATION PAGE | Form Approved OMB No. 0704-0188 |
|---|---|



| 1. AGENCY USE ONLY *(Leave blank)* | 2. REPORT DATE | 3. REPORT TYPE AND DATES COVERED |
|---|---|---|
| | 19 Jun 1998 | |

**4. TITLE AND SUBTITLE**
Oral Contraceptive Use and Affective Changes Across the Menstrual Cycle

**5. FUNDING NUMBERS**

**6. AUTHOR(S)**
Jill J. O'Rear

**7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)**
University of Washington

**8. PERFORMING ORGANIZATION REPORT NUMBER**
98-026

**9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)**
THE DEPARTMENT OF THE AIR FORCE
AFIT/CIA, BLDG 125
2950 P STREET
WPAFB OH 45433

**10. SPONSORING/MONITORING AGENCY REPORT NUMBER**

**11. SUPPLEMENTARY NOTES**

**12a. DISTRIBUTION AVAILABILITY STATEMENT**
Unlimited distribution
In Accordance With AFI 35-205/AFIT Sup 1

**12b. DISTRIBUTION CODE**

**13. ABSTRACT** *(Maximum 200 words)*



**14. SUBJECT TERMS**

**15. NUMBER OF PAGES**
52

**16. PRICE CODE**

| 17. SECURITY CLASSIFICATION OF REPORT | 18. SECURITY CLASSIFICATION OF THIS PAGE | 19. SECURITY CLASSIFICATION OF ABSTRACT | 20. LIMITATION OF ABSTRACT |
|---|---|---|---|
| | | | |

Oral Contraceptive Use and Affective Changes
Across the Menstrual Cycle

by

Jill J. O'Rear

A Thesis ~~proposal~~ submitted in partial fulfillment of the
requirements for the degree of

**Master of Nursing**

University of Washington

1998

Approved by: _____ 5/28/98
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Ellen S Mitchell 5/28/98
Ellen S. Mitchell, Committee Member Date

Program Authorized
to Offer Degree _____

Date 5/28/98

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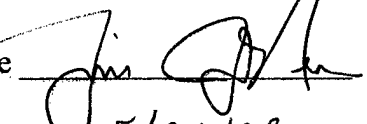
Signature 

Date 5/28/98

University of Washington

Abstract

Oral Contraceptive Use and Affective Changes

Across the Menstrual Cycle

by Jill J. O'Rear

Chairperson of the Supervisory Committee:

Nancy F. Woods, PhD.

As of 1988, 10.7 million women were using oral contraceptives for contraception. Oral contraceptives manipulate the normal cyclical endogenous female hormone profile. There are several side effects that may occur with the use of oral contraceptives. These side effects are an interplay of type of hormonal preparation, dose of hormone(s), female physiology, and the unique biologic makeup of each woman. A myriad of possible physical effects is well-known and documented. Effects on mood (affect) are not as well addressed and tend to focus more heavily on negative states.

Healthcare providers must obtain informed consent from a woman before prescribing OCs. A woman has the right to be provided with all information available about any effects she may experience as a result of her choice to use OCs. We as healthcare providers have the obligation to exhaustively seek out all possible effects of the medications we prescribe. Only then can we empower our clients to make truly informed contraceptive decision-making.

The data utilized for this secondary analysis is the product of a study titled "The Prevalence of Perimenstrual Symptoms" conducted by Woods, Lentz, and Mitchell. There were 608 participants in the parent study; 327 were in the final sample of those

women who had recorded at least one full menstrual cycle. There were 45 women taking OCs in the final sample.

A Positive Affect Scale and a Negative Affect Scale were derived from the Washington Women's Health Diary (WWHD) utilized in the parent study. These scales were used to measure positive and negative mood in each phase of the menstrual cycle (menses, postmenses, ovulatory, and premenses).

When OC users and non-users were compared there were no statistically significant ($p < .05$) differences in positive or negative mood within each of the menstrual cycle phases. Analysis of the mood scores by cycle phases and by pill type revealed no statistically significant ($p < .05$) differences between the progestational and estrogenic pills. Finally, the OC users and non-users who had premenstrual syndrome (PMS) were compared to determine whether there was a greater proportion of women with PMS using OCs; there was no difference.

In this sample, there were no differences in mood between OC users and non-users. This work should replicated and extended, testing women before and after OC use.

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ACKNOWLEDGMENTS

The author wishes to express sincere appreciation to Professor Nancy Woods for all of her guidance and assistance during the data analysis and manuscript preparation phases of this thesis. In addition, special thanks to Professor Ellen Mitchell for her assistance in the preparation of this manuscript.

# Chapter 1: INTRODUCTION.

## Problem

As of 1988, 60% (35 million) of women of reproductive age (15-44 years) were using some type of contraception (Mosher & Pratt, 1990). By far the most prevalent selection was oral contraception (10.7 million, or 33%)(Mosher & Pratt). When divided into use by age groups, 59.8% of all 20-24 year-old women, 39.7% of 25-29, and 20.4% of those 30-34 used oral contraceptives (Trussell & Vaughan, 1989). Other choices included male sterilization (4.1 million), condoms (5.1 million), and female sterilization (9.6 million)(Mosher & Pratt).

Oral contraceptives (OCs) manipulate the normal cyclical endogenous female hormone profile (Bancroft & Rennie, 1993). OCs prevent the ovarian cycle that would otherwise occur (follicular proliferation, ovulation, and development of the corpus luteum). There are three basic types of OCs: combined monophasic, combined phasic, and progesterone-only. Hormone levels are attained exogenously and remain constant on the monophasic OC regimen. Multiphasic OCs increase the progestin component in the latter half of the cycle, which imitates the normal luteal phase increase in progesterone (Walker & Bancroft, 1990). Two types of phasic OCs also vary the amount of estrogen, with an increase the second week of the cycle and a decrease the third week of the cycle.

There are several side effects, major and minor, that may occur with the use of OCs. These side effects are an interplay of type of hormonal preparation, dose of hormone(s), female physiology, and the unique biologic makeup of each woman. For example, the

total estrogenic effect is related not only to the OC dose of estrogen but also to endogenous ovarian estrogens, as well as estrogens synthesized from adipose tissue (Hatcher et al., 1994).

A myriad of possible physical effects is well-known and documented. Effects on mood (affect) are not as well addressed and tend to focus more heavily on negative states. For example, it is generally accepted that OCs may cause depression and irritability (Dickey, 1994; Hatcher et al., 1994). Other positive and negative affective changes are generally not addressed. The possible interplay of OCs with pre-existing premenstrual mood symptoms has been explored to some degree in studies on premenstrual syndrome (PMS).

Healthcare providers must obtain informed consent from a woman before prescribing OCs. Components included in this consent which must be addressed are the benefits and risks of the method (Hatcher et al., 1994). This consent may or may not be in writing. There are no universal standardized consent forms that specifically list all of the components of OC informed consent. It is the responsibility of each individual provider and/or setting to establish and follow local policies on informed consent.

A woman has the right to be provided with all information available about any effects she may experience as a result of her choice to use OCs. We as healthcare providers have the obligation to exhaustively seek out all possible effects of the medications we prescribe. Only then can we empower our clients to make truly informed contraceptive decisions.

## Definitions and Framework

*Affect* is defined as the emotional reaction associated with an experience (Thomas, 1993). It is synonymous with mood. Affect is the end result of internal as well as external influences. Physical and psychological stressors, social factors, hormones, and other stimuli are external factors. Internal elements include hormones, neurotransmitters, and physiological processes.

*Positive affect* refers to positive mood states such as enthusiasm, alertness, attentiveness, interest , excitement, happiness, joy, and sociability. *Negative affect* is just the opposite. Hostility, downheartedness, anger, fear, guilt, irritability, tension, depression, anxiety, and loneliness are examples of negative affect.

The woman is the center of the framework of this study. No woman exists in isolation from her environment; she is affected by external as well as internal stimuli, which together influence her affect. The concept "together" is important because in most people mood is the product of many factors. Synergistic action of stimuli is involved.

Woods, Lentz, Mitchell, and Oakley (1994) studied factors associated with affective experiences in womens' lives. The factors examined were personal resources (years of education, income), social resources (unconflicted network size), socialization (including religiosity), social demands (negative and positive events, conflicted network size), mean age in years, employment status, number of children, depression score, and self esteem score. The results varied by race (Asian, Black, White). The main finding was that womens' social networks are important in protecting them from depression as well as

promoting their self esteem.

Once a mood is established, it has the ability to effect not only the person experiencing it but everyone around her. Typically people belong to multiple groups in their lives. Families, work groups, and social contacts are some examples of groups. Members of groups are impacted, either positively or negatively, by the moods and actions of each other. This fact reinforces the reality that people do not exist in vacuums but are affected by others and in turn effect others.

## Purpose

The purpose of this study was to examine the relationship between OC use (exogenous hormone) and changes in affect throughout the menstrual cycle in women with and without preexisting premenstrual complaints. This relationship was studied by using data from a study designed to describe the prevalance of perimenstrual symptom patterns. Forty five of these women were on OCs at some point during the study and were compared to a non-user group. The research questions were: 1) Is there any difference in mood across the menstrual cycle between OC users and non-users?, 2) if so, can anything else account for the difference?, and 3) is there any difference in the proportion of women with and without PMS using OCs?

# Chapter 2: REVIEW OF LITERATURE

## Hormones and the Menstrual Cycle

Women are unique in many different ways, but especially from a hormonal standpoint. With few exceptions (most notably pregnancy and menopause), women experience cyclic variations in their endogenous hormones. These changes are multifactorial and therefore quite complex.

Not only are there gender differences in hormones, there are individual differences from woman to woman. One woman may have a high baseline hormone level while the next may have a low hormone level. Additionally, some women are more hormone sensitive than others, probably related to their baseline levels (Dickey, 1994).

The main female hormones are estrogen and progesterone. The highest brain concentration of estrogen and progesterone receptors are located in parts of the limbic system involved in the regulation of mood, behavior, sex drive, and autonomic function, as well as in parts of the brain stem regulating autonomic function (Keefe, 1994).

Estrogens are responsible for female secondary sex characteristics. The ovary is the primary source of secretion; some estrogens are synthesized from adipose tissue. Estrogens affect other hormones and carrier proteins (Olds, London, & Ladewig, 1992).

Progesterone is secreted by the corpus luteum (the follicle after ovulatory rupture). Its main effect is on the endometrium, where it plays a large role in the implantation and nurturance of the embryo.

The menstrual cycle operates on a feedback system involving the hypothalamus,

pituitary gland, and the ovary. The theoretical menstrual cycle has 28 days; in reality, the length of the cycle varies from 25 to 35 days or more (Hatcher et al., 1994). Menses onset is considered day one of the menstrual cycle. Estrogen and progesterone activity fluctuates greatly during the menstrual cycle. The gonadotropins, follicle-stimulating hormone (FSH) and luteinizing hormone (LH), interact with these hormones via a feedback loop.

The menstrual cycle can be influenced by, and exerts influence on, neurotransmitters and many hormones. These include B-endorphins, prolactin, cortisol, adrenaline, noradrenaline, corticotropin releasing factor, and adrenocorticotropin hormone (Barnea & Tal, 1991; Negro-Vilar, 1993; Schenker, Meirow, & Schenker, 1992; Domar & Seibel, 1989; Vermeulen, 1993). These potential interactions may help to explain cyclical symptoms that some women experience.

Menstrual Cycle-related Changes ("Molimina")

As alluded to earlier, hormonal changes during the menstrual cycle are dramatic. They are a result of the complex interplay of the hypothalamus, pituitary gland, and the ovaries. Given this intimate association and the fact that the hypothalamus and pituitary have multiple other non-reproductive functions in the body, it is not difficult to conceptualize that as the menstrual cycle progresses and hormones fluctuate, physical and psychological manifestations may occur.

Commonly reported menstrual cycle changes are generally undesirable and may occur premenstrually (late luteal phase), with menstruation (early follicular), and at ovulation.

These phenomena can be physical and psychologic. Possible premenstrual changes include weight gain, bloating, swollen eyes, breast fullness, breast tenderness, anxiety, depression, headaches, nausea, acne, spotting, discharge, pain, and constipation. Menstrual experiences may include irritability, anxiety, depression, bleeding, lower abdominal pain, back and leg pain, headaches, nausea, dizziness, diarrhea, increased or decreased libido, infection, and nosebleeds. And finally, possible ovulatory occurrences are vaginal secretions, nausea, sharp or dull pain, spotting, and increased libido (Hatcher et al., 1994). Note that with the exception of increased libido, all of the possible effects are undesirable. The presentation of these changes varies; some women may experience no symptoms and others may have one or more.

Stewart (1989) studied desirable premenstrual changes. At least one positive premenstrual change was reported by 66% of the subjects. The most common changes were increased sexual interest and enjoyment, tendency to clean and tidy, tendency to get things done, more attractive breasts, more energy, and more creative ideas.

Menstruation is not a solely biological event that occurs separately from everyday life; it also happens in a social context (Paige, 1971). Attitudes towards menstruation are largely formed by socialization. Many cultures perceive menstruation negatively, as an event to be hidden and shunned (Paige). In Western culture knowledge of the presence of menstrual blood is to be avoided (for example, the commercials that tout their product's ability to protect against unsightly accidents) (Bancroft, 1995; Jarvis & McCabe, 1991). In other cultures menstruating women are viewed as unclean and

contact with them is prohibited (for example, banishment to menstrual huts or prohibition of sexual intercourse during menstruation) (Paige).

It has been hypothesized that this negative socialization in itself may share a role in premenstrual and menstrual complaints (Bancroft, 1995). Whitehead, Busch, Heller, and Costa (1986) demonstrated a correlation between young girls whose mothers experience negative menstrual symptoms and predisposition to menstrual distress themselves.

Daily life events and stressors may temper a woman's symptoms at any given point in her cycle. For example, a negative stressor may influence negative cycle perceptions. Laessle, Tuschl, Schweiger, and Pirke (1990) found that womens' global mood and depression were related to subjective stress ratings and not gonadal hormone levels. Taylor, Woods, Lentz, Mitchell, and Lee (1991) developed and tested an explanatory model for PNA (perimenstrual negative affect). They found that the women with stressful lives and who were distressed in general had the most PNA. In addition, socialization to negative attitudes concerning menstruation influenced PNA through its influence on general distress.

Anticipation may have a role in the perception of symptoms. A woman who has historically heavy menstrual bleeding may perceive her cyclic changes more negatively than if her flow were light (Paige, 1971).

In summary, there are many factors involved in women's experience of the normal menstrual cycle. Given this multifactorial situation, it is probable that a synergistic combination of elements, rather than a single one, contributes to symptoms throughout

the cycle.

Oral Contraceptive Cycle Changes

The first "pill" was approved by the FDA in 1960 (Perone, 1994). It was patented as Enovid-10. Its formulation was 10 mg of norethynodrel (a progestin) and 150 to 230 mcg of mestranol (an estrogen). It was taken from the 5$^{th}$ to the 24$^{th}$ day of the menstrual cycle. Subsequent OCs contained from 60-150mcg of mestranol per tablet (Goldzieher, 1994).

In 1975, Goldzieher, Chenault, and Cervantes demonstrated that the estrogen and progestin components of OCs functioned synergistically, and ovulation could be inhibited with much lower doses than originally thought. Thus came about the modern OC preparation, with greatly reduced dosages and side effects.

Effects of OC use vary in presence and quality depending, in part, on the preparation type and dosage. Combined OCs contain an estrogen (either ethynyl estradiol or mestranol) and a progestin (norethindrone, norethindrone acetate, ethynodiol diacetate, norgestrel, levonorgestrel, norethynodrel, desogestrel, or norgestimate) (Hatcher et al., 1994). The dosage of the estrogen varies from 20mcg to 50mcg and the progestin ranges from 0.15mg to 1.5mg (Dickey, 1994). The progestin dosage range is so wide because some progestins are much more potent than others.

Minor effects of combined OCs (estrogens and progestins) differ and can be classified according to their etiology. Breast enlargement, fluid retention, nausea, cyclic weight gain, leukorrhea, and cervical ectopy are estrogenic effects. These are less likely to occur

if the estrogen content of the OC is less than 50mcg (Hatcher et al., 1994).

Progestational effects include breast tenderness and headaches. Increased appetite and weight gain, depression, fatigue, tiredness, decreased libido, acne, oily skin, increased LDL and decreased HDL cholesterol, pruritis, and decreased carbohydrate tolerance are androgenic effects related to OC progestin quantity and type (Hatcher et al., 1994).

Multiphasic OCs are characterized by variation of hormone dosages and patterns. There are two (biphasic) to three (triphasic) different phases of dosage, increments of progestins and either incremental or stable estrogen. Dosage changes are dependent upon specific formulation and vary from 7 to 14 days (biphasic) to 6 to 10 days (triphasic) (Dickey, 1994). These OCs can cause any of the aforementioned effects.

The "mini-pill" contains only progestin. It can cause amenorrhea or other menstrual cycle disturbances, as well as the above listed progestational effects (Hatcher et al., 1994).

The introduction of OCs into normal menstrual cycle events changes physiological dynamics. These exogenous hormones override the normal functioning of the woman's body by suppressing ovulation and causing changes in the endometrium and cervix that prevent conception and implantation. The end result is an already complex physiological process becoming even more complicated.

Premenstrual Syndrome

Premenstrual syndrome (PMS) is characterized by a group of mood, behavioral,

cognitive, and somatic symptoms which are distressful, cyclic, and increase in intensity across the cycle (high premenses and low after onset of menstruation) (Mitchell, 1991). Over 150 symptoms have been associated with PMS (Rubinow & Roy-Byrne, 1984). Five symptom clusters containing a total of 33 symptoms were identified in a study by Woods, Lentz, Mitchell, Lee, and Taylor (1986). The Menstrual Symptom Severity List (MSSL) represents these symptoms (Table 1). The list consists of the most commonly reported, highest severity symptoms in menstruating women (in the population at large) (Woods et al., 1986). PMS symptom patterns vary from individual to individual and from cycle to cycle (Mitchell).

According to Mitchell (1991), PMS is not defined well enough (type of symptoms, symptom severity, and amount of change in severity) to be called a true syndrome, nor is it a disease since no abnormality can be identified. However, it is well-established how debilitating this syndrome can be (Gise, 1995).

PMS has been studied extensively but remains elusive in terms of exact causation (Mitchell, 1991). There have been multiple theories, biologic and social, regarding the possible mechanisms of PMS (Parry, 1994). Biologic factors implicated in contributing to PMS symptoms include luteinizing hormone (LH), follicle-stimulating hormone (FSH), melatonin, serotonin, thyroid stimulating hormone, prolactin, testosterone, B-endorphin, prostaglandin, vitamins, electrolytes, and glucose (Parry). The majority of studies concerning these potential components have been equivocal or shown no association (Parry).

PMS associations with estrogen and progesterone have also been studied. Results have been mixed. Mitchell, Lentz, and Woods (1994) found that women with a PMS symptom pattern have a less steep drop in urinary estradiol levels premenstrually. Hammarback, Damber, and Backstrom (1989) found that women had more severe symptoms during cycles with a higher luteal phase serum estradiol and progesterone concentration. Redei and Freeman (1995) found a positive correlation between progesterone levels and PMS symptoms; progesterone levels preceded PMS symptoms by 5 to 7 days. Rubinow and associates (1988) and Dinnerstein and associates (1993) found no differences in the levels of urinary estrogen and progesterone between women with and without PMS.

A 1998 study by Woods, Lentz, Mitchell, Shaver, and Heitkemper examined the relationship between perceived stress, ovarian steroids, stress arousal indicators, and premenstrual symptoms in 74 women. Their findings suggest that perceived stress and cortisol play a significant role in the PMS symptom pattern. They also found that women without PMS had a more gradual drop in estradiol premenses.

The most promising biological theory is that of serotonin involvement. Serotonin is a potent vasoconstrictor which is thought to be involved in neural operations significant in sleep and sensory perception (Thomas, 1993). Studies have shown a consistent decrease in premenstrual levels of serum serotonin in women with PMS (Parry, 1994). In their study, Sunblad, Modigh, Andersch, and Eriksson (1992) found that clomipramine (serotonin reuptake inhibitor) was effective in decreasing premenstrual symptoms in

women with PMS.

Halbreich (1990) found that women with premenstrual dysphoric changes have decreased imipramine (IMI) receptor binding in the early luteal phase, five to seven days before symptom development, and following the periovulatory gonadal hormone changes. Dysphoric symptoms were eliminated with the ovulation suppressant danazol. Rojansky, Halbreich, Zander, Barkai, and Goldstein (1991) examined 5-HT uptake and IMI binding (shown to share serotogenic brain mechanisms). IMI binding was lower in women with PMS than in control subjects, suggesting a possible pre-existent vulnerability to this syndrome.

Fink, Sumner, Rosie, Grace, and Quinn (1996) studied the effects of estrogen on central monoamine neurotransmission in female rats. They demonstrated, for the first time, that estrogen stimulates a significant increase in the density of certain binding sites in the brain that are involved with the control of mood, mental state, cognition, emotion, and behavior. These findings may explain how therapy with 5-HT uptake blockers works for treatment of the depressive premenstrual symptoms of PMS.

In other studies, melatonin secretion seems to be different in women with PMS than in asymptomatic women (Parry, 1994). Women with PMS have lower levels of melatonin as well as a significant earlier offset of melatonin secretion during all menstrual cycle phases. (Melatonin and serotonin are related; melatonin is synthesized from serotonin.)

Psychological theories of PMS etiology have already been reviewed under the normal menstrual cycle symptoms section. These include socialization, stressors, and

anticipation.

It is probable that no one factor is solely responsible for PMS. Rather, the syndrome results from a complex interplay of multiple components.

## Menstrual Cycle-related Affective Changes - Research

### Menstrual Cycle-related Changes

Several studies have been done on the occurrence of affective changes during the menstrual cycle in normal women. The results have been ambiguous. Some found no significant changes in mood states (Abplanalp, Donnelly, & Rose, 1979; Abplanalp, Rose, Donnelly, & Livingston-Vaughn, 1979; Gallant, Hamilton, Popiel, Morokoff, & Chakraborty, 1991; Jarvis & McCabe, 1991; Laessle et al., 1990; Lahmeyer, Miller, & DeLeon-Jones, 1982). Others discovered a relationship between positive and/or negative mood changes in relation to the menstrual cycle (Collins, Eneroth, & Landgren, 1985; Huerta-Franco & Malacara, 1993; May, 1976; Metcalf, Livesey, Wells, & Braiden, 1989; Moos, 1969; Moos et al., 1969; Sanders, Warner, Backstrom, & Bancroft, 1983).

Dennerstein and Burrows' 1979 review of research concerning affect and the menstrual cycle suggested that many women do indeed experience cyclical affective changes. Positive changes are most often reported in the follicular or mid-cycle phases and include pleasantness, increased vigor, and elation. Negative changes such as irritability, headache, tension, anxiety, sleep disturbance, and depression are more frequent in the menstrual and premenstrual phases.

Gallant and associates (1991) studied 30 women and 23 males. One group of women

was aware of their cycle phase (menstrual, early follicular, late follicular, periovulatory, early luteal, late luteal, and premenstrual) and the other was not. Both groups were studied for two menstrual cycles. Blood was drawn nine times during the second cycle to characterize the cycle and identify ovulation. Written tools were completed daily by all subjects. There was no difference in affect between the aware women and males premenstrually or menstrually nor any significant difference between the aware and unaware women.

Huerta-Franco and Malacara (1993) studied 502 women (384 non-pill and 118 contraceptors, including 29 OC users). OC users were not evaluated separately from non-users. A questionnaire and modified Keye calendar were used to prospectively collect data. They found that negative affective symptoms were associated with the premenstrual phase as well as biologic factors and lifestyle.

Summary of Research on Menstrual Cycle-related Changes. Several methodological practices used in these studies are not optimal. Problems with existing studies include calendar determination of menstrual cycle phase versus determination by hormone levels (women vary widely in their cycle and phase lengths), limited duration of study, not excluding women with PMS, and failure to collect other data that may impact affect (life events, lifestyle, physical symptom severity, awareness of cycle phase). Tools varied widely, with the Moos MDQ being one of the more consistent. Most tools focus on negative symptoms.

Studies on normal menstrual cycle affective changes have been equivocal. The results

range from no significant changes in mood states throughout the cycle to increased negative mood in luteal (premenstrual) and menstrual phases to increased positive affect in follicular and ovulatory phases. In those studies that measured serum hormone levels, no association was found between these levels and mood states. It is clear that additional research, using more optimal methodology, is needed on this subject.

Oral Contraceptive Cycle Changes

Affect in OC users has been less well-studied than affect in non-users. Almagor and Ben-Porath (1991), Harding, Vail, and Brown (1985), and Marriott and Faragher (1986) found no difference in negative affect of OC users and non-users. Warner and Bancroft (1988) concluded that OC users were less likely to have peaks (any stage) and premenstrual troughs in well-being than non-users. However, OC users were more likely to experience menstrual troughs. Paige (1971) found no cyclic negative affect in combination OC users, versus its presence in non-users.

In a continuing prospective cohort study in which subject data is collected from their general practitioners every six motnhs, Kay (1984) concluded that there is no increased rate of depression in low-dose (≤ 35 mcg) estrogen users. Condon, Need, Fitzsimmons, and Lucy (1995) found worsening of psychological variables (specifically mood swings, depression, clarity of thought, and tension) in OC users, while Kutner, Phillips, and Hoag (1971) and Kutner and Brown (1968) found decreased premenstrual moodiness and irritability. Worsley (1980) found decreased vigor in users of OCs as compared to non-users. Almagor and Ben-Porath (1991) found an increased level of positive affect in OC

users, while Wilcoxon, Schrader, and Sherif (1976) found no such increase.

Almagor and Porath (1991) studied 20 OC users (formulation not given) and 30 non-users over a 45-day period. The entire menstrual cycle was assessed for both positive and negative affect. Results indicated that OC users experience a higher level of positive affect (attentiveness, interest level, alertness, and enthusiasm) than do non-users, particularly during the menstruation, follicular, and luteal phases of the cycle. There was no difference in negative affect between the two groups.

Condon et al. (1995) investigated 145 women for premenstrual and overall experiences. Fifty-five percent of the subjects were current OC users; of these, 49% took triphasics, 43% monophasics, and 8% biphasics (specific formulations not given). The 45% non-pill were former OC users. One questionnaire (modified Menstrual Distress Questionnaire, MDQ) was administered. All OC users were found to have decreased emotional well-being.

Summary of Research on Oral Contraceptive Cycle-related Changes (Table 2). Many of the study designs were flawed in some way. Several studies were retrospective. Many only tracked negative affect. Duration of study was commonly limited to one cycle. Exact type and dosage of OC formulation used varied widely, and some didn't give any specifics beyond designation as an OC. Tools varied widely, with the Moos MDQ (or a variation) being the most often used. As noted by Keefe (1994), until recently most tools used in studies on OC effect on mood were designed for psychiatric syndromes, not steroid-related manifestations. This makes it unlikely that the instruments measured

what they were intended to measure.

Studies of affect in OC users have been equivocal. The findings have ranged from no difference in affect between OC users and controls to higher levels of positive affect in OC users to decreased emotional well-being in OC users. This may be partially explained by the multitude of different OC preparations used, since it is well-known that different formulations can cause different effects. There is a clear need for quality studies on this topic.

Oral Contraceptive Effect on PMS Sufferers

In studies of women with PMS, Walker and Bancroft (1990) and Graham and Sherwin (1992) found no beneficial effects of OCs for mood changes. Bancroft and Rennie (1993) found that OC users showed less improvement in their negative mood during the menstrual phase than non-users, which indicates either a delayed or more prolonged pattern of perimenstrual negative mood.

A beneficial effect of OC treatment on mood scores was found in a single blind quasi-experimental study by Backstrom, Hansson-Malmstrom, Lindhe, Cavalli-Bjorkman, and Noredenstrom (1992). The women in the study served as their own controls. The first month of daily prospective data collection was for baseline establishment. Two cycles on a monophasic OC followed, then two cycles on a triphasic OC were completed. Mood improvement was less pronounced with the monophasic preparation of desogestrel than with monophasic and triphasic levonorgestrel.

Graham and Sherwin's 1992 investigation was the first double-blind, placebo-

controlled trial of OCs in women with PMS. This was a quasi-experimental study with 20 women on triphasic OCs and 25 on placebo. One month of baseline data was prospectively collected, then three cycles were completed on either the treatment or the placebo. Ovulation was verified in the third cycle by testing for a progesterone surge. No beneficial nor detrimental effect of OCs on mood symptoms was found.

Summary of Research on Oral Contraceptive Effect on PMS Sufferers. There have been very few studies done on this topic. Most have been prospective and have durations of at least two cycles. Some studies used women with self-perceived PMS (as opposed to clinically diagnosed). Only two studies were quasi-experimental, and their findings were the opposite of each other. OC preparations used have been different, and sometimes not addressed in the literature.

Results of studies regarding the impact of OCs on PMS have been ambiguous. Findings have ranged from improved overall mood scores to less severe premenstrual mood to significantly more negative affect postmenstrually to lower mood throughout the entire cycle. It is apparent that many more studies (ideally quasi-experimental) need to be accomplished on this subject.

## Literature Review Summary

In summary, the studies done thus far concerning the use of OCs and associated affect throughout the menstrual cycle have been ambiguous and oftentimes methodologically flawed. There is a distinct need for more quality research on this topic that has the potential to affect millions of women. Studies should ideally be prospective, focus on

positive as well as negative mood changes, use control subjects, precisely pinpoint cycle phase, and collect pertinent data that may influence mood (feminine socialization, life events, stressors).

The purpose of this study was to examine the relationship between OC use (exogenous hormone) and changes in affect throughout the menstrual cycle in women with and without preexisting premenstrual complaints. This relationship was studied by using data from a study designed to describe the prevalance of perimenstrual symptom severity patterns. Forty five of these women were on OCs at some point during the study and were compared to a non-user group. The research questions were: 1) Is there any difference in mood across the menstrual cycle between OC users and non-users?, 2) If so, can anything else (such as demographic factors, personal resources, personal health practices, social demands, psychological and distress) account for the difference?, and 3) Is there any difference in the proportion of women with and without PMS using OCs.

# Chapter 3: METHODOLOGY AND PROCEDURE

## Study Design

The data utilized for this secondary analysis is the product of a study titled "The Prevalence of Perimenstrual Symptoms" conducted by Woods, Lentz, and Mitchell (1983-1986). The original study was done to describe the prevalence of perimenstrual symptoms in a population-based sample.

The parent study used a cross-sectional hybrid study design. A cross-section of the community was selected and followed longitudinally. Current OC users and non-users were followed over the course of 90 days to assess their mood and symptom patterns. The original researchers collected additional data including income, education, socialization, parity, age, personal health practices, life events, and psychological distress.

## Sample

The sample for the original study was obtained using a multistage sampling procedure. Census block groups were selected according to age, income, ethnicity, and educational criteria with the goal of mirroring the general population of a large northwestern metropolitan city. Street segments from these census block groups were identified and then randomly ordered by computer. Telephone numbers for households within the segments were obtained from a city directory. A total of 5755 households were contacted by telephone; 1135 women between 18 and 45 years of age were identified. Of these potential subjects 656 women were eligible. Criteria for inclusion

were an age of 18 to 45 years, not pregnant, not being treated for gynecologic problems, having menses, and able to write and understand English. The final sample consisted of women with at least one full menstrual cycle of daily prospective data recorded in the WWHD (n = 327). There were 45 women taking OCs in the final sample.

The sample for the secondary analysis consisted of the 327 participants who completed the original study. OC users (n = 45) were compared as a group to non-users (n = 282).

Sample Characteristics. The majority of women in the final original sample (n = 327) were employed (76%) and partnered (61%). Caucasian women comprised 61% of the sample, Black 16% and Asian 15%. Average years of education was 14.3, mean family income ranged from $29,000 to $30,999, and mean years of age was 32.4 (SD = 6.8). OCs were being taken by 14% (n = 45). Sixty-six percent had been pregnant at least once. The mean menstrual cycle length was 29.5 days (SD = 5.3) and mean duration of menses was 5.3 days (SD = 1.7).

For the secondary analysis, the sample was divided into two groups: OC users (n = 45) and non-OC users (n = 282) (see Table 3). The mean age of OC users was 29 years, versus 33 years for non-OC users. Approximately 61% of each group was married/partnered. The mean income level of the OC group was $28,000 and $28,999 for the non-OC group. Eighty-two percent of the OC group was employed compared to 76% of the non-OC group. Mean years of education was 14 for the OC group and 14.4 for the non-OC group.

Measures

The primary constructs of interest for this study were menstrual cycle phase, OC use, socialization, personal resources, personal health practices, social demands, psychological distress, demographic factors, and positive and negative affect. Items used as indicators of positive and negative affect were taken from the original Washington Women's Health Diary (WWHD), developed by Woods, Lentz, Mitchell, Lee, & Taylor (1986). The WWHD included 57 positive and negative mood symptoms frequently reported to fluctuate across the menstrual cycle. The participants rated each item on a 0 to 4 scale, when 0 = not present and 4 = extreme.

Positive Affect. Positive affect was defined as positive mood states such as enthusiasm, alertness, attentiveness, interest, excitement, happiness, joy, and sociability. Bursts of energy/activity, well-being, in control, and increased activity were items from the WWHD used in the parent study reflecting positive affect. The alpha coefficient for the positive affect scale is 0.726 (premenstrual).

Negative Affect. Negative affect was defined as just the opposite of positive affect. Anger, anxiety, depression, desire to be alone, feelings of guilt, hostility, impatient/intolerant, impulsiveness, irritable, lonely, lowered desire to talk/move, nervousness, out of control, rapid mood changes, restlessness or jitteriness, tearfulness/crying easily, and tension were items from the WWHD used in the original study reflecting negative affect. The alpha coefficient for the negative affect scale is 0.895 (premenstrual).

OC Use. OC use was defined as the consistent intake of any type of OC. This original data was obtained by study interviewers as well as diary review. Forty-five women in the final parent study sample were OC users.

For the secondary analysis OCs were classified as primarily estogenic or primarily progestational in respect to their effects on the body based on Dickey's (1994) classification. Effects of more estrogenic preparations may include breast enlargement, fluid retention, nausea, cyclic weight gain, leukorrhea, and cervical ectopy. Effects of progestational preparations may include breast tenderness, headaches, increased appetite and weight gain, depression, fatigue, tiredness, decreased libido, acne, oily skin, increased LDL and decreased HDL cholesterol, pruritis, and decreased carbohydrate tolerance.

Menstrual Phase. The menstrual phase is an endometrial stage of the menstrual cycle and encompasses the days of endometrial shedding. Progesterone levels are low due to the deterioration of the corpus luteum in the latter part of the luteal phase. Estrogen levels are likewise low. Days 1 through 5 are generally considered menstrual days. The original study used days 1 and 3 for scoring purposes.

Postmenstrual Phase. The postmenstrual phase is that part of the menstrual cycle following menstruation. It includes the follicular phase, an ovarian stage of the menstrual cycle in which the follicles proliferate and a dominant follicle is selected. This is an estrogen dominant phase; a critical level of estrogen is necessary to trigger the LH surge necessary for ovulation to occur. OCs interrupt the normal ovarian cycle so

women taking them stilll produce estrogen and experience a follicular phase, but do not ovulate. The parent study used days -17, -19, and -21 as postmenstrual days for scoring purposes.

Ovulatory Phase. Ovulation is the emergence of the ovum from the follicle, occurring on approximately day -14 of the menstrual cycle. After estrogen levels peak, LH peaks and follicular rupture/ovulation ensues. Women on OCs do not ovulate. For scoring purposes the original study used days -13, -14, and -15 for the ovulatory phase.

Premenstrual Phase. The premenstrual phase is that part of the menstrual cycle preceding menstruation. It is the late part of the luteal phase. Following ovulation, the corpus luteum secretes progesterone to prepare the endometrium to receive conceptus. If no implantation occurs the corpus luteum deteriorates 9 to 11 days after ovulation. The premenstrual phase was defined as days -5 to -1 of the menstrual cycle. The parent study used days -5, -3, and -1 for scoring purposes.

PMS. Premenstrual syndrome (PMS) is characterized by a group of mood, behavioral, cognitive, and somatic symptoms which are distressful, cyclic, and increase in intensity across the cycle (high premenses and low after onset of menstruation)(Mitchell et al., 1991). Prospective data from the WWHD were analyzed in the parent study and women meeting PMS classification criteria were identified as having premenstrual syndrome.

Socialization. Feminine socialization refers to internalization of societal beliefs about women and their roles. Menstrual socialization includes beliefs and expectations about menarche and menstruation. These types of socialization were measured by two tools in

the parent study: menstrual socialization and the Attitudes Towards Women Scale (Spence & Helmreich, 1978).

Personal Resources. Personal resources act as buffers to the demands and stresses associated with the experience of everyday living. Examples of personal resources are education and income. These variables were verbally collected from the subjects by the original interviewer.

Personal Health Practices. Personal health practices are the things women do (or not) to care for themselves and their health. They may be either beneficial or detrimental. Health practices were measured in the original study by the modified Belloc and Breslow health habits questionnaire (current cigarette smoking, consumption of alcohol-containing beverages, consumption of caffeine, sleeping habits, physical exercise, body size, and eating habits) (Belloc & Breslow, 1972; Garrow & Webster, 1985; Wingard, Berkman, & Brand, 1982).

Social Demands. Social demands refers to those obligations that arise from social connections (e.g. work, marriage, parenting). They present challenge or stress and are a result of everyday living. The Norbeck revision of the Sarason Life Events Survey was the data collection tool used in the parent study (Norbeck, 1984; Sarason, Johnson, & Siegel, 1978).

Psychological Distress. Psychological distress refers to depressed mood. It was measured by the Center for Epidemiologic Studies Depression Scale (CES-D) in the original study (Radloff, 1977).

In addition, other demographic factors that may be influential on affect were scrutinized. These areas of interest included age, marital status, parity, number of children, and employment.

## Procedure

The participants in the original study were interviewed in their homes, by a trained interviewer, in order to obtain measures utilized in the analysis. The women were given instructions on keeping a daily health diary. They were asked to complete this diary for three menstrual cycles (90 days) and then to mail it back.

## Methods of Analysis

To begin the secondary analysis, the study's databases were checked to verify data entry accuracy of OC/hormonal use. Frequencies, reliability estimates using Cronbach's alpha, and sum scores were derived for all individual symptom values in menses, postmenses, ovulatory, and premenses phases. Results were checked for appropriateness of values, including range, mean, and standard deviation in order to locate any incorrect data entry by identifying any values outside of the possible range.

# CHAPTER 4: RESULTS

The purpose of the secondary analysis was to examine the relationship between OC use and changes in affect throughout the menstrual cycle (in women with and without pre-existing premenstrual changes) and to explore whether women's moods can be explained by any other differences between OC users and non-users. Potential differences examined include demographic factors, socialization, personal resources, personal health practices, social demands, and psychological distress.

Using the Positive and Negative Affect Scales, OC users' mood was compared to that of non-users for each phase of the menstrual cycle (Table 4). T-tests (2-tail) for independent samples were used for this evaluation. There were no statistically ($p < .05$) significant differences between OC user and non-user groups, indicating no difference in mood in each menstrual cycle phase between OC user and non-user groups.

T-tests (2-tail) for independent samples were run to identify any statistically significant differences between OC user and non-user groups on the variables that could influence mood. T values were used to evaluate for statistically significant ($p < .05$) differences between the groups on these variables (Table 3). There was a significant difference between the groups on age (OC users were younger than non-users; 28.6 years vs. 33.2 years), marital status (fewer OC users were married or partnered than non-users; 60.9% vs. 61.6%), and exercise (OC users exercised much less than OC users; 108 minutes weekly vs. 173.6 minutes weekly).

In order to consider the differences in age between OC user and non-user groups, the

sample was divided into two groups by age (Table 5). The first group was ≤ 30 years old and the second group was > 30 years old. Within the ≤ 30 year-old subgroup, 29 were OC users and 82 were non-users. The > 30 year-old subgroup consisted of 16 OC users and 200 non-users.

T-tests (2-tail) for independent samples were run for each menstrual cycle phase and the corresponding positive and negative symptom profiles within each age group. There were no significant differences between OC users and non-users in either positive or negative affect for any cycle phase. There were no differences for either the women less than or equal to 30 years old (Table 6) or those more than 30 years old (Table 7).

OC data was then separated into OC types (by dominance of estrogenic activity versus progestational activity) in order to detect any differences in menstrual cycle affect between the users of different OC types (Table 8). This division was accomplished according to Dickey's (1994) criteria for estrogenic and progestational pills. Four OCs were equally estrogenic and progestational so they were omitted. In a few cases, the subject couldn't recall the exact name of the OC so these data were also omitted.

The OCs were recoded into the progestational category (n = 11) or the estrogenic category (n = 35). T-tests (2-tail) for independent samples were run to identify any statistically significant ($p < .05$) differences in mood by progestational and estrogenic pill type groups. T values were evaluated for significant ($p < .05$) differences between estrogenic and progestational pill type groups. There was no significant mood difference between the progestational and estrogenic pill type groups, so there was no difference in

mood in each menstrual cycle phase between the estrogenic and progestational pill type groups.

Finally, the OC users and non-users who had PMS were compared by crosstabulation to determine whether there was a greater proportion of women with PMS using OCs (Table 9). In the original study, 31 of the final participants (10%) were classified as having a PMS symptom pattern; most of these women were non-users. Five of the 31 women with a PMS symptom pattern (16%) were using OCs and 26 (84%) were non-users. Five of the 45 OC users (11%) had a PMS symptom pattern versus 26 of the 282 non-users (9%).

Since this was not an experimental study, it is not possible to draw any conclusions about the causal order of OC use and PMS. However, there was no significant difference in the percentage of women with a PMS symptom pattern in the OC group and the non-user group.

# CHAPTER 5: CONCLUSIONS, IMPLICATIONS, AND RECOMMENDATIONS

The purpose of this study was to examine the relationship between OC use and changes in affect throughout the menstrual cycle in women with and without preexisting menstrual complaints. There were no significant differences between OC users and non-users in positive or negative mood within the four menstrual cycle phases. Because OC users were younger than non-users, analyses were repeated for women > 30-years-old and ≤ 30-years-old. There were no significant differences between OC users and non-users in either subgroup in positive or negative mood within each of the four menstrual cycle phases.

In addition, women using primarily progestational and primarily estrogenic pills were compared. There were no significant differences in positive or negative mood within the four menstrual cycle phases. Finally, when women with and without PMS were considered, the percentage using OCs was not significantly different.

One possible reason that no difference in positive or negative mood was found may be that the number of study participants taking OCs was too low (n = 46) to reveal any differences. It is also possible that the tools used did not adequately assess positive affect. The affective data collected by the parent study was primarily negative; there were only four positive items selected for the Positive Affect Scale for this secondary analysis, versus seventeen for the Negative Affect Scale. Another possibility is that the parent study may have assessed negative affect more accurately than other studies that did find a difference in mood.

with negative affect who find they are exacerbated by OCs will stop using them. Likewise, women who start OC use and become depressed also may stop using them.

The results of this secondary analysis are consistent with those studies that show no relationship between oral contraceptive use and positive or negative affective changes in each phase of the menstrual cycle (Table 2). The inconsistency of study results on this subject suggests that there is another factor (internal and/or external) involved which has not yet been assessed.

I recommend further study to examine the relationship between OC use and affect across the menstrual cycle. This study would be quasi-experimental to control for the placebo effect (prospective, with control subjects), would precisely pinpoint cycle phase, and would collect more data on positive mood. It would also collect any conceivable information that might influence mood, including all of the information gathered in the parent study. Other areas of interest might include religious preference, positive life stressors, prior use of OCs, and culture.

Another more realistic option for further investigation would be to replicate this study. Testing could be extended to before and after OC use. Individual differences in how women respond to estrogen and progesterone could be examined.

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Table 1

Washington Women's Health Diary (WWHD)

Daily Experience List

1. Abdominal pain, discomfort*
2. Anger*
3. Anxiety*
4. Awakening during the night*
5. Backache*
6. Bloating or swelling of abdomen*
7. Blurred or fuzzy vision
8. Bursts of energy or activity
9. Confusion
10. Cramps - uterine or pelvic
11. Craving for specific foods or tastes*
12. Craving for alcohol
13. Decreased appetite
14. Decreased food intake*
15. Decreased sexual desire*
16. Depression (feel sad or blue)*
17. Desire to be alone*
18. Diarrhea
19. Difficulty concentrating*
20. Difficulty in getting to sleep*
21. Difficulty making decisions*
22. Dizziness or lightheadedness
23. Early morning awakening*
24. Fatigue or tiredness
25. Feelings of guilt*
26. Feelings of well-being
27. Forgetfulness
28. General aches and pains
29. Headache*
30. Hostility*
31. Hot flashes or sweats*
32. Impatient, intolerant*
33. Impulsiveness
34. In control
35. Increased activity
36. Increased appetite
37. Increased food intake
38. Increased sensitivity to cold*
39. Increased sexual desire
40. Increased sleeping*
41. Intentional self-injury
42. Irritable*
43. Lonely*
44. Lowered coordination/clumsiness
45. Lowered desire to talk/move*
46. Nausea
47. Nervousness
48. Out of control*
49. Painful or tender breasts*
50. Rapid mood changes*
51. Restlessness or jitteriness
52. Sensation of weight gain*
53. Skin disorders*
54. Suicidial ideas or thoughts
55. Swelling of hands or feet*
56. Tearfulness, crying easily*
57. Tension*

* Menstrual Symptom Severity List (MSSL)

(Woods, Lentz, Mitchell, Lee, & Taylor, 1986)

Table 2

Review of Literature: OC Formulations and Mood

| Study | N | Type of OC | Outcomes |
|---|---|---|---|
| Almagor & Ben-Porath (1991) | 20 OC<br>30 non-user | -formulation not given | -OC users had a higher level of positive affect<br>-no difference (OC user vs non) on negative affect |
| Condon, Need, Fitzsimmons, & Lucy (1995) | 11 OC<br>11 non-user<br>11 male | -formulation not given | -OC users had decreased overall emotional well-being<br>-OC users had worsening mood swings, depression, clarity of thought, and premenstrual tension |
| Harding, Vail, & Brown(1985) | 29 OC | -formulation not given | -no significant difference in negative affect between users and non-users |
| Kay (1984) | 9,000 | -multiple | -low-dose (≤ 35mcg)estrogen had same rate of depression as non-users<br>-no relationship between depression and progestin component of OC |
| Kutner & Brown (1974) | 1513 OC<br>1313 never<br>1093 non-user | -multiple (classified combo or sequential) | -combination OC users had significantly less premenstrual moodiness and iritability than sequential<br>-OC users in general had significantly less premenstrual moodiness and irritability than non |
| Kutner, Phillips, & Hoag (1971) | 49 OC | -not stated | -mean depression scores identical before and after OC<br>-sig. decreased premenstrual moodiness and irritability |
| Marriott & Faragher (1986) | 34 OC<br>31 non-user | -multiple | -increased negative emotional symptoms premenstrual week<br>-no significant difference between OC users and non-users |

Table 2

Review of Literature: OC Formulations and Mood (cont'd)

| Study | N | Type of OC | Outcomes |
|---|---|---|---|
| Paige (1971) | 52 combo<br>12 sequential<br>38 non-user | -combination, various<br>-sequential, various | -no cyclic negative affect in combination users<br>-U-shaped pattern of negative affect in non-users |
| Warner & Bancroft (1988) | 359 monophasic<br>283 triphasic<br>3252 non | -formulations not given | -OC users less likely to have premenstrual peaks and postmenstrual troughs than non<br>-monophasic users have increased peaks or troughs of well-being during menses |
| Wilcoxon, Schrader, & Sherif (1976) | 11 OC<br>11 non-user<br>11 males | -formulations not given | -no changes in positive moods<br>-no sig. overall difference between men and women in moods<br>-stressful events account more for cycle variance in negative affect than cycle phase |
| Worsley (1980) | 21 OC<br>6 IUD | -Neogynon (estrogenic)<br>-Eugynon (high estrogen and progestin)<br>-Minovlar (progestational) | -OC users in general have more anger<br>-Neogynon users had decreased anger and tension scores |

Table 3

Comparisons of OC Users vs. Non-users

| | OC Users (n = 282) mean, | SD | Non-users (n = 45) mean, | SD | t-value | df |
|---|---|---|---|---|---|---|
| Age | 28.6 | 6.7 | 33.2 | 6.6 | 4.26* | 60 |
| Married/Partnered | 60.9% | | 61.6% | | 1.98* | 328 |
| Number of Children | 1 | 1.4 | 1.2 | 1.2 | .87 | 328 |
| Income (Annual $) | 28,000 | 11,400 | 28,999 | 11,800 | .38 | 321 |
| Years of Education | 14 | 1.6 | 14.4 | 2.1 | 1.43 | 72 |
| Currently Employed | 82.2% | 39% | 75.9% | 43% | .93 | 325 |
| Confirmed Pregnancies | 1.4 | 2.1 | 1.9 | 1.8 | 1.56 | 327 |
| Body Mass Index (BMI) | 22.6 | 5.9 | 24 | 6.4 | 1.38 | 331 |
| Negative Life Events | 12 | 10 | 8.8 | 7.8 | 2.34 | 289 |
| Exercise (minutes/week) | 108.1 | 126.6 | 173.6 | 231.7 | 1.89* | 331 |
| Drinks/week | 2.1 | 3.8 | 2.6 | 4.2 | .79 | 322 |
| Feminine Socialization | 16.9 | 3.5 | 17.9 | 3.8 | 1.79 | 328 |
| Attitudes Towards Women | 78.1 | 12.1 | 80.4 | 12.1 | 1.18 | 326 |
| Anxiety | 4.7 | 3.2 | 4.6 | 3 | .29 | 271 |
| Depression | 14 | 11.3 | 10.5 | 8.8 | 1.98 | 52 |

* $p < .05$

Table 4

Mood in Each Menstrual Cycle Phase for OC Users and Non-users

| | OC Users (n = 45) mean, SD | | Non-users (n = 282) mean, SD | | t-value | df |
|---|---|---|---|---|---|---|
| Menstrual | | | | | | |
| Positive | 6.9 | 5.9 | 8.0 | 6.2 | 1.12 | 321 |
| Negative | 11.2 | 14.9 | 9.7 | 11.7 | .61 | 52 |
| Postmenstrual | | | | | | |
| Positive | 11.3 | 8.4 | 13.2 | 9 | 1.31 | 319 |
| Negative | 15.5 | 18.6 | 13.0 | 16.2 | .93 | 319 |
| Ovulatory | | | | | | |
| Positive | 12.0 | 9.0 | 13.2 | 8.9 | .8 | 320 |
| Negative | 12.8 | 12.4 | 12.9 | 17.8 | .01 | 77 |
| Premenstrual | | | | | | |
| Positive | 11.4 | 8.3 | 13.0 | 9.4 | 1.07 | 323 |
| Negative | 16.6 | 22.3 | 13.0 | 15.1 | 1.03 | 49 |

* $p < .05$

Table 5

Comparison of OC Users vs. Non-users, ≤ 30-years-old and > 30 years-old

| | OC Users | | Non-users | | | |
|---|---|---|---|---|---|---|
| | mean, | SD | mean, | SD | t-value | df |
| Age | | | | | | |
| ≤ 30 y.o. | 24.4 | 3.9 | 24.9 | 4 | .6 | 109 |
| > 30 y.o. | 35.8 | 3.9 | 36.5 | 4 | .77 | 215 |
| Married/Partnered | | | | | | |
| ≤ 30 y.o. | 1.52 | .51 | 1.45 | .5 | .61 | 109 |
| > 30 y.o. | 1.76 | .44 | 1.69 | .46 | .68 | 215 |
| Number of Children | | | | | | |
| ≤ 30 y.o. | .6 | 1.1 | .5 | .9 | .25 | 109 |
| > 30 y.o. | 1.7 | 1.8 | 1.4 | 1.2 | .63 | 17 |
| Income (Annual $) | | | | | | |
| ≤ 30 y.o. | 25,800 | 11,400 | 27,000 | 12,400 | .4 | 104 |
| > 30 y.o. | 31,900 | 9,800 | 29,800 | 11,200 | .6 | 213 |
| Years of Education | | | | | | |
| ≤ 30 y.o. | 14 | 1.6 | 13.8 | 2.1 | .32 | 109 |
| > 30 y.o. | 14.1 | 1.6 | 14.7 | 2 | 1.06 | 215 |
| Currently Employed | | | | | | |
| ≤ 30 y.o. | 79% | 41% | 74% | 44% | .56 | 108 |
| > 30 y.o. | 88% | 34% | 77% | 42% | .98 | 213 |
| Confirmed Pregnancies | | | | | | |
| ≤ 30 y.o. | .9 | 1.3 | 1 | 1.5 | .37 | 109 |
| > 30 y.o. | 2.4 | 2.9 | 2.3 | 1.8 | .13 | 17 |
| BMI | | | | | | |
| ≤ 30 y.o. | 21.3 | 3.2 | 23.1 | 5.9 | 2.07* | 91 |
| > 30 y.o. | 25.8 | 7.5 | 24.6 | 6.4 | .74 | 215 |
| Negative Life Events | | | | | | |
| ≤ 30 y.o. | 11.9 | 10.1 | 9.1 | 7.6 | 1.42 | 94 |
| > 30 y.o. | 12.1 | 10.2 | 8.6 | 8 | 1.65 | 191 |
| Exercise (minutes/week) | | | | | | |
| ≤ 30 y.o. | 96.2 | 96.8 | 195.7 | 222.9 | 3.27* | 104 |
| > 30 y.o. | 128.9 | 170.2 | 166.4 | 237 | .64 | 215 |
| Drinks/week | | | | | | |
| ≤ 30 y.o. | 2.5 | 3.7 | 2.1 | 3.8 | .5 | 107 |
| > 30 y.o. | 1.3 | 3.9 | 2.8 | 4.4 | 1.35 | 211 |

Table 5 (cont'd)

Comparison of OC Users vs. Non-users, ≤ 30-years-old and > 30-years-old

| | OC Users mean, | SD | Non-users mean, | SD | t-value | df |
|---|---|---|---|---|---|---|
| Feminine Socialization | | | | | | |
| ≤ 30 y.o. | 16.5 | 3.5 | 18.3 | 4.2 | 2.12* | 109 |
| > 30 y.o. | 17.5 | 3.4 | 17.8 | 3.6 | .26 | 215 |
| Attitudes Towards Women | | | | | | |
| ≤ 30 y.o. | 77.3 | 12.2 | 79 | 11.2 | .69 | 109 |
| > 30 y.o. | 79.4 | 12.2 | 81 | 12.5 | .49 | 213 |
| Anxiety | | | | | | |
| ≤ 30 y.o. | 4.6 | 3.2 | 5.1 | 3.1 | .07 | 92 |
| > 30 y.o. | 5 | 3.1 | 4.4 | 3 | .78 | 177 |
| Depression | | | | | | |
| ≤ 30 y.o. | 15.1 | 12.3 | 12.3 | 8.6 | 1.07 | 35 |
| > 30 y.o. | 12.4 | 9.5 | 9.7 | 8.7 | 1.23 | 199 |

* $p < .05$

Table 6

Mood in Each Menstrual Cycle Phase for OC Users and Non-users, ≤ 30-years-old

| | OC Users (n = 29) | | Non-users (n = 82) | | | |
|---|---|---|---|---|---|---|
| | mean, | SD | mean, | SD | t-value | df |
| Menstrual | | | | | | |
| Positive | 5.7 | 5.7 | 8.3 | 7.5 | 1.66 | 106 |
| Negative | 10.3 | 13.4 | 11.1 | 13.3 | .28 | 106 |
| Postmenstrual | | | | | | |
| Positive | 10.2 | 8.9 | 13.3 | 9.9 | 1.49 | 106 |
| Negative | 17 | 21.1 | 13.8 | 18 | .77 | 106 |
| Ovulatory | | | | | | |
| Positive | 10.4 | 9.6 | 13.1 | 9.7 | 1.25 | 106 |
| Negative | 12.9 | 12.6 | 14.9 | 21.4 | .57 | 81 |
| Premenstrual | | | | | | |
| Positive | 10.2 | 8 | 12.9 | 10.6 | 1.22 | 106 |
| Negative | 16.4 | 19.7 | 14.4 | 17.8 | .49 | 106 |

* $p < .05$

Table 7

Mood in Each Menstrual Cycle Phase for OC Users and Non-users, > 30-years-old

| | OC Users (n = 16) mean, | SD | Non-users (n = 200) mean, | SD | t-value | df |
|---|---|---|---|---|---|---|
| Menstrual | | | | | | |
| Positive | 8.7 | 5.9 | 7.9 | 5.7 | .52 | 208 |
| Negative | 12.9 | 17.9 | 9.2 | 10.9 | .81 | 16 |
| Postmenstrual | | | | | | |
| Positive | 13.4 | 7.5 | 13.1 | 8.7 | .14 | 206 |
| Negative | 13.4 | 14.2 | 12.7 | 15.6 | .18 | 206 |
| Ovulatory | | | | | | |
| Positive | 14.6 | 7.4 | 13.3 | 8.6 | .59 | 208 |
| Negative | 13.3 | 12.5 | 12.1 | 16.1 | .28 | 208 |
| Premenstrual | | | | | | |
| Positive | 13.3 | 8.9 | 13.1 | 9 | .08 | 210 |
| Negative | 17.6 | 27.3 | 12.6 | 14 | .72 | 16 |

* $p < .05$

Table 8

Mood in Each Menstrual Cycle Phase, by Pill Type

| | Progestational (n = 11) mean, | SD | Estrogenic (n = 35) mean, | SD | t-test | df |
|---|---|---|---|---|---|---|
| Menstrual | | | | | | |
| Positive | 7.7 | 5.1 | 6.3 | 6.3 | .67 | 43 |
| Negative | 7.1 | 4.1 | 9.6 | 11.4 | 1.09 | 42 |
| Postmenstrual | | | | | | |
| Positive | 15 | 8.8 | 11.1 | 7.7 | 1.42 | 44 |
| Negative | 14.2 | 16 | 16.4 | 21.1 | .32 | 44 |
| Ovulatory | | | | | | |
| Positive | 11.2 | 8.1 | 11.6 | 8.9 | .13 | 44 |
| Negative | 14.9 | 11 | 15.2 | 21.1 | .04 | 44 |
| Premenstrual | | | | | | |
| Positive | 13.4 | 10.5 | 11.1 | 8.6 | .71 | 43 |
| Negative | 8.3 | 7.5 | 13.3 | 18.4 | 1.3 | 40 |

* $p < .05$

Table 9

PMS and OC Use

| | PMS Symptom Pattern | Non-PMS Symptom Pattern | Row Total |
|---|---|---|---|
| OC User | 5 | 41 | 46 |
| | | | 14.3 |
| Non-user | 26 | 249 | 275 |
| | | | 85.7 |
| Column Total | 31 | 290 | 321 |
| | 9.7 | 90.3 | 100.0 |